

Re-examination of an Amphistome (Trematoda) Collection Deposited in the Geneva Museum with a Description of *Orthocoelium saccocoelium* sp. n.

by

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With 13 figures

ABSTRACT

Re-examination of an amphistome collection deposited in the Geneva Museum revealed a new species, *Orthocoelium saccocoelium* sp. n.: with pharynx of a new type, called Saccocoelium. The most characteristic specific features are the structure of the pharynx and the caeca. Histo-morphological examinations of the samples constitute this collection contributed to make identification of species more precise and to correction of geographical distribution of several species forming the scope of this collection.

The collection of the amphistome parasites deposited in the Geneva Museum derived from the Institute of Zoology, Neuchâtel. Samples were collected mainly by the late Professor Ch. Joyeux but seemingly it was enlarged from other sources as well.

Samples of this collection have been preserved in alcohol and during their re-examination median sagittal sections were prepared by the usual method and they were stained in haematoxylin and eosin and mounted in balsam.

The major part of the localities of the samples refers to Indo-China, Africa, India, Madagascar, South-America; some of them, however, are without indication of the locality.

On the basis of gross-morphological and anatomical examinations some species were published by JOYEUX (1924), JOYEUX & HOUEMER (1928). Histo-morphological re-examination contributed to make more precise identification and, consequently, geographical distribution of several species forming the scope of this collection.

RESULTS AND DISCUSSION

In the course of re-examination of this collection four samples with several mature and a great number of immature specimens were found which represented a new species. Description of it was based on these specimens. All measurements are in millimetres (with a mean in parenthesis), if otherwise indicated.

***Orthocoelium saccocoelium* sp. n.**

Description. The body is conical, banded to the ventral surface (fig. 1), length 3,2-3,8 (3,5), greatest width 1,7-1,9 (1,8) before the level of the acetabulum, dorso-ventral dimension 1,2-1,9 (1,6). Pharynx usually subterminal, length 0,7-0,9 (0,76), width 0,40-0,45 (0,42). It is a new type, called *Saccocoelium*. In the structure of this pharynx there are interior, middle and exterior circular layers; interior longitudinal layer moderately (about 150 μ), external longitudinal layer poorly developed (Figs 1-3). There is a well developed ($100 \times 100 \mu$) anterior sphincter (Figs 2,4) and a weakly developed posterior one (Figs 2, 5). Lip sphincter and the basal circular layer are absent (Fig. 8). Radial layer moderately developed, its fibres forke toward the outer surface of the pharynx.

The oesophagus is about as long as the pharynx, without muscular thickening. Caeca lateral, making numerous sharp bends on either side of the body and terminate beyond the acetabulum. Along the second half of the caeca several packet-like flares are observable (Fig. 6).

Testes are oval, laterally elongated, situated one behind the other in the middle-line of the body (Fig. 1). Length of anterior testis 0,20-0,22 (0,21), width 0,92-1,20 (1,06), dorso-ventral dimension 0,45-0,60 (0,52). After uniting of vasa efferentia they form vas deferens with several convolutions and further parts of the male reproductive duct: pars prostatica, pars muscosa, ductus ejaculatorius. The pars prostatica is moderately developed, length is about 150 μ with some rows of the prostatic cells. Pars muscosa: short, with 4 to 10 convolutions.

Ovary slightly oval, 0,17-0,20 (0,18) $\times$ 0,17-0,25 (0,21), situated in the mid-line of the body between the posterior testis and the acetabulum. Ootype complex contains Mehlis' gland, common vitelline duct and Laurer's canal. The latter as an even tube opens dorsally about 0,5 before the excretory pore. Uterine coils found dorsally, at about the level of the anterior testis they turn ventrally and reach the genital opening with a thin walled metraterm.

The acetabulum is subterminal, *Streptocoelium* type, outer diameter 0,7-0,9 (0,8). Muscle units of the muscle layers are d.e.: 21-24; d.i.: 27-33; v.e.: 25-26; v.i.: 26-31.

The genital opening mid-ventral, at the level of the bifurcation. Length 0,25-0,41 (0,35), dorso-ventral dimension 0,25-0,31 (0,26). Ductus ejaculatorius and the metraterm form a short (about 0,1) hermaphrodite canal. The structure of the genital opening is identical with that of the Ichikawai type, having a sphincter papillae and a well developed radial musculature in the genital atrium (Fig. 7).

The eggs are thin-walled, operculate 0,10-0,13 (0,11) $\times$ 0,05-0,075 (0,058). Vitellaria lateral, vitelline follicles are small, commencing at the level of the intestinal bifurcation and terminating at the middle of the acetabulum.

The excretory bladder is postero-dorsal, spherical, situated between the acetabulum and the posterior testis, near to the body surface. The excretory duct and Laurer's canal do not cross each other, the former opens at the level of the body end.

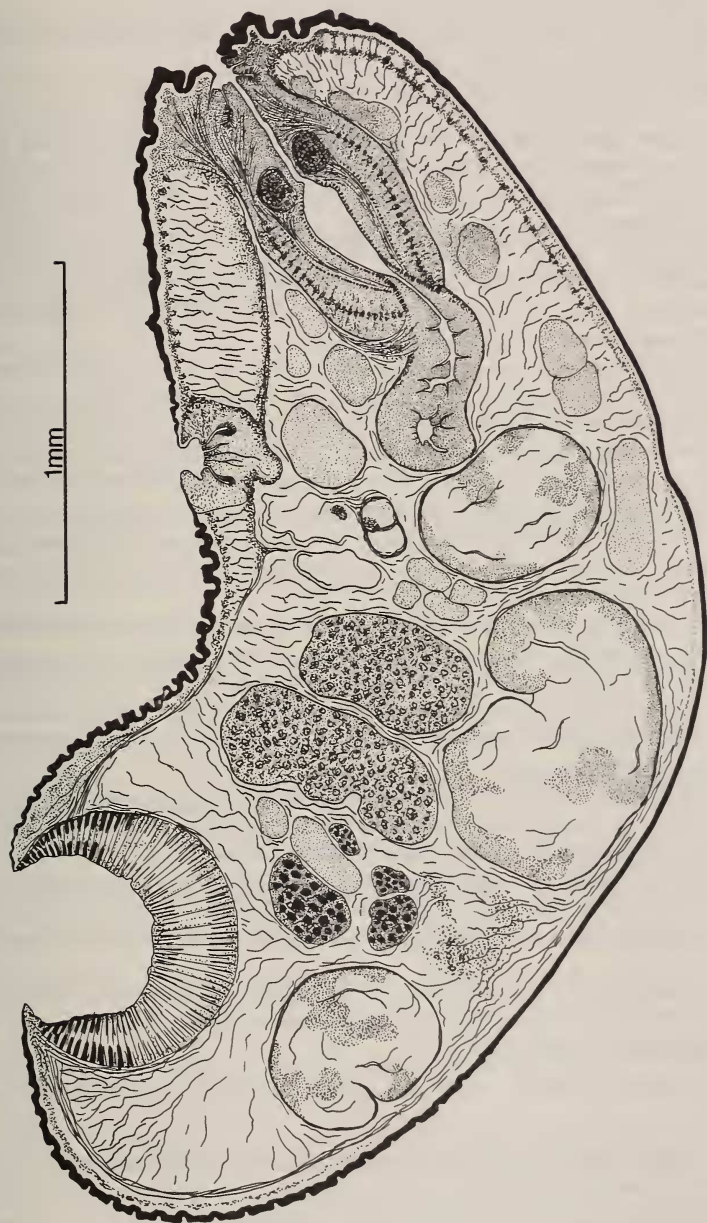


FIG. 1.

Orthocoelium saccocoelium sp. n. median sagittal view.

Type host: deer.

Habitat: rumen.

Type locality: Indo-china.

Type specimens: Holotype and paratypes: Department of Zoology, College of Education, Pécs, Hungary, No. 671 (1-5).

Paratypes: Natural History Museum, Geneva, Switzerland, No. 989. 186.

Relationships. On the basis of the structure of the acetabulum and the position of the excretory as well as Laurer's canals species herein described has been assigned to the genus *Orthocoelium* (Stiles et Goldberger, 1910). Although the opinions vary whether the species belong to the genus *Orthocoelium*; without a critical review we put among this genus the species below: *O. dawesi* (Gupta, 1958), *O. dicranocoelium* (Fischöeder, 1901), *O. naesmarki* (Mukherjee, 1963), *O. narayani* (Gupta et Gupta, 1972), *O. orthocoelium* (Fischöeder, 1901), *O. scoliocoelium* (Fischöeder, 1904), *O. spinicephalus* (Tandon, 1955) and *O. streptocoelium* (Fischöeder, 1901).

As to the new species, *O. saccocoelium* differs from each of the above listed species in the structure of the pharynx. In species of the genus *Orthocoelium* two types of pharynxes, *Paramphistomum* and *Dicranocoelium* are described. The latter is characterized by the presence of the lip sphincters in both lateral regions of the pharynx (Fig. 8) *O. saccocoelium* has no lip sphincters but has an anterior and a posterior ones as well as a middle circular layer has also occurred. Such a combination of muscle elements is not found in species of this genus but it is a unique feature among amphistomes (NÄSMARK 1937) in which features are blending characters of lower and higher types of amphistomes.

The genital atrium is provided with a sphincter papillae and atrial-radial muscle elements. Thus it has the same structure as that *O. narayani* and, at the same time, the structure of the genital atria of both *O. saccocoelium* and *O. narayani* are identical with the Ichikawai type. In other species of this genus the genital atrium has no circular musculature (*Gracile* type) or has both sphincter papillae and genital sphincter (*Scoliocoelium*, *Streptocoelium* types).

The caeca of the species of the genus *Orthocoelium* are usually even tubes terminating at the level of the acetabulum. Packet-like flares along the posterior half of the caeca seem to be special peculiarity of the species *O. saccocoelium*.

The following species are represented in this Amphistome collection after revision (in brackets eventual former names; locality and hosts are copied from the original labels). The sign * indicates that the sample was not fit for more precise identification.

Calicophoron calicophorum (Fischöeder, 1901): Tonkin, ruminants (Amphistomidae sp.); Mossamédes, *Bos taurus* (*Paramphistomum cervi*); Rhodesia, ox, stomach (*Paramphistomum explanatum*).

Carmyerius cruciformis (Leiper, 1910): Aguigadji, hippopotame, estomac (*C. cruciformis*).

C. mancupatus (Fischöeder, 1909): Kouroussa (Guinée), bœuf indigène (*Gastrothylax* sp.); Madagascar, *Bos taurus*.

Carmyerius sp. *: *Tragelaphus scriptus* (*Gastrothylax* sp.), localité ?.

Cotylophoron cotylophorum (Fischöeder, 1901): Labé (Guinée), bœuf, paroi estomac (*Paramphistomum cervi*); Kissa (Algérie), bœuf, indigène (*Paramphistomum* sp.).

Fischöderius cobboldi (Poirier, 1883): Indochine, cerf; Indochine, cerf, estomac.

F. elongatus (Poirier, 1883): Indochine, cerf; Nha-Trang (Vietnam), bufflon, panse (Amphistomes); Shangai, buffle, panse (*Carmyerius gregarius*); Saigon, bœuf, rumen; Saigon, bufflon, panse; Inde, bœuf (*Gastrothylax* sp.); Indochine, cerf; Indochine, cerf, estomac.

Gastrothylax crumenifer (Creplin, 1847): Inde, lot B, cattle (*Gastrothylax* sp.); Nha-Trang, bufflon, panse (Amphistomes), Inde, bœuf (*Gastrothylax* sp., *Amphistoma* sp.); Saigon, bufflon, panse; Inde, cattle (*Gastrothylax* sp.); Inde, bœuf (*Gastrothylax* sp.); Saigon, bufflon; Saigon, bufflon, panse; Baria (Vietnam), chevreuil; Saigon, bœuf, rumen.

Gastrothylacidae gen. et sp. *: Haute-Sangha (RCA), antilope sp.; Saigon, bœuf, estomac.

Gigantocotyle explanatum (Creplin, 1847): Nha-Trang (Sud-Vietnam), buffle, canal hépatiche (*A. explanatum*?).

G. gigantocotyle (Brandes in Otto, 1896): Angola, *Hippopotamus amphibius* (*Amphistoma gigantocotyle*).

Gigantocotyle sp. *: Saigon, ruminants (*Paramphistomum bathycotyle*).

Homalogaster paloniae Poirier, 1883: Hanoi, *Bos taurus* (*Homalogaster poirieri*); Saigon, bœuf, estomac (*Homalogaster*).

Nilocotyle duplicisphinctris Sey et Graber, 1980: Aquigadji, hippopotame, estomac (*C. cruciformis*).

N. microatrium Näsmark, 1937: Aquigadji, hippopotame, estomac (*C. cruciformis*).

N. minutus Näsmark, 1937. Aquigadji, hippopotame, estomac (*C. cruciformis*).

Orthocoelium dicranocoelium (Fischoeder, 1901): Saigon; bœuf estomac; Indochine, cerf.

O. gigantopharynx (Schad, Kuntz, Antenson et Webster, 1964): Indochine, cerf.

O. saccocoelium sp. n.: Indochine, cerf; Shangai, buffel, panse (*C. gregarius*); Indochine, cerf, estomac; Indochine, cerf.

O. scoliocoelium (Fischoeder, 1901): Inde, bœuf (*Gastrothylax* sp.)

O. streptocoelium (Fischoeder, 1901): Indochine, cerf.

Paramphistomum bothriophoron (Braun, 1892): Madagascar, *Bos taurus*.

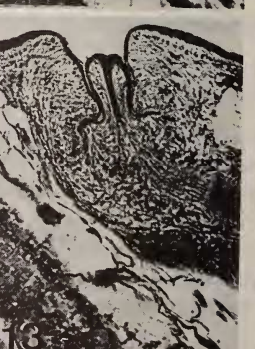
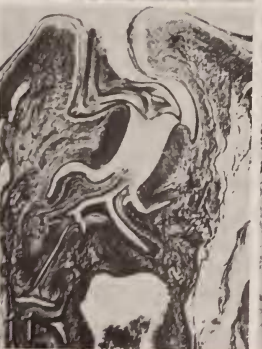
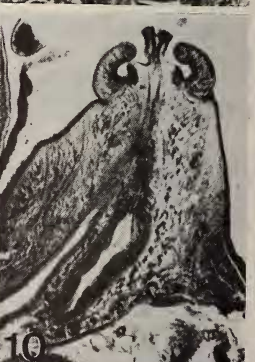
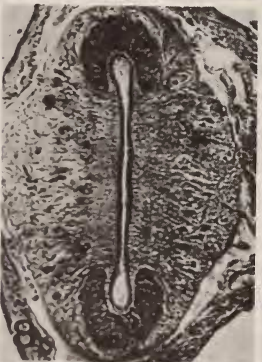
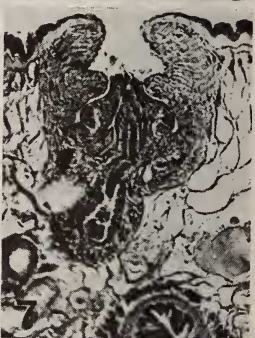
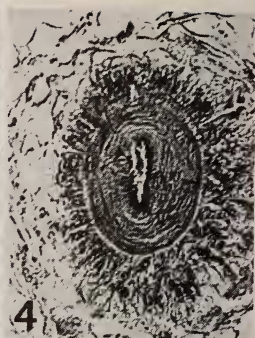
P. clavula Näsmark, 1937: *Hippotragus beckeri* (*Carmyerius spatiosus*).

P. epiclitum Fischoeder, 1904: India, cattle, lot C (*Gastrothylax* sp.).

P. liorchis Fischoeder, 1901: Guyane hollandaise, *Mazama rufa* (= *M. americana*) (*Paramphistomes*).

P. microbothrium Fischoeder, 1901: Kouroussa (Guinée), bœuf indigène (*Paramphistomum cotylophoron*); Lourenço Marques (Mozambique), *Bos taurus* (*Paramphistomum cervi*); Madagascar, *Bos taurus*; Kouroussa, mouton maure (*Paramphistomum* sp.); W-Africa, ox, stomach (*Cotylophoron cotylophorum*); Accra, W-Africa, ox, stomach (*Paramphistomum cervi*); Kouroussa, zébu (*Paramphistomum cotylophoron*); coll. Looss (*Paramphistomum microbothrium*); Kissa (Algérie), bœuf indigène (*Paramphistomum cotylophoron*).

P. phillerouxi Dinnik, 1961: Loanda (Angola), bœuf (*Paramphistomum cervi*)



Paramphistomum sp. *: *Cobus leucotis* (*Paramphistomum cervi*).

Stichorchis subtriquetrus (Rud., 1814): Mus. Wien, *Castor fiber* (*S. subtriqueter*).

Some cases of multiple infestation have been recorded:

F. elongatus, *O. saccocoelium* (buffle, Shanghai); *F. elongatus*, *O. saccocoelium* (cerf, Indochine); *F. cobboldi*, *F. elongatus*, *O. saccocoelium* (cerf, Indochine); *F. elongatus*, *G. crumenifer* (bufflon, Nha-Trang); *N. cruciformis*, *N. duplicisphinctris*, *N. microatrium*, *N. minutus* (hippopotame, Aquigadji); *F. cobboldi*, *F. elongatus*, *O. dicranocoelium*, *O. saccocoelium*, *O. streptocoelium*, *O. gigantopharynx* (cerf, Indochine); *F. elongatus*, *G. crumenifer*, *O. scoliocoelium*, *P. epiclitum* (bœuf, Inde).

HISTO-MORPHOLOGICAL REMARKS

In the establishment of the genus *Calicophoron* NÄSMARK (1937) attributed great importance to the absence of the d.e.2 muscle layer. In samples collected in South Africa with a typical genital opening (Fig. 10) the d.e.2 muscle layer has been observable (Fig. 9). These muscle units (10-12) were found by SWART (1954) for the first time in this species. These findings indicate that certain areas of the range of this species the d.e.2 usually occurs and this character is not seem to be so constant as it was believed by NÄSMARK (1937).

In the genital opening of *Paramphistomum clavula*, found in our sample, the enormously developed genital sphincter was found (Fig. 11). This feature seems to be a good character of its own.

The genital sphincter in the genital opening of the species *Gigantocotyle gigantocotyle* is less developed than that of the *Clavula* type of genital atrium (Fig. 12) contrary to NÄSMARK's (1937) indication.

In sample of *Carmyerius cruciformis* specimens with 4,4 body length contained eggs (0,12-0,14 × 0,06-0,07). Our finding seems to be the smallest specimen having eggs in its uterus.

The genital opening of the species *Orthocoelium dicranocoelium* is of the Gracile type (Fig. 13) and in specimens found in this collection slightly developed radial muscle elements can also observe.

ACKNOWLEDGEMENT

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PLANCHE I:

FIG. 2: median sagittal section of pharynx of *O. saccocoelium*. FIGS 3-5: cross sections of pharynx of *O. saccocoelium*; 3: at level of middle region; 4: at level of anterior sphincter; 5: at level of posterior sphincter. FIGS 6-7: median sagittal sections of *O. saccocoelium*; 6: caecum at posterior region; 7: genital opening. FIG. 8: cross section of pharynx of *O. dicranocoelium* at level of lip sphincters. FIGS 9-10: median sagittal sections of *Calicophoron calicophorum*; 9: dorsal half of acetabulum; 10: genital opening. FIG. 11: median sagittal section of genital opening of *Paramphistomum clavula*. FIG. 12: median sagittal section of genital opening of *Gigantocotyle gigantocotyle*. FIG. 13: median sagittal section of genital opening of *O. dicranocoelium*.

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